

WHAT IS CLAIMED IS:

1. An ink-jet head comprising:
 - a passage unit in which a plurality of pressure
5 chambers each connected to a corresponding nozzle are
arranged adjacent to each other along a plane; and
 - an actuator unit that is fixed to the passage unit to
change the volume of the pressure chambers,
wherein the actuator unit includes:
 - 10 a piezoelectric element that spans a plurality of
pressure chambers,
 - a plurality of individual electrodes that have been
sintered on a surface of the piezoelectric element at
positions corresponding to the respective pressure chambers,
15 and
 - one or more sintered members that are, on the surface
of the piezoelectric element provided with the plurality of
individual electrodes, spaced from an outermost one of the
individual electrodes with respect to an arrangement
20 direction of the plurality of individual electrodes, in an
outward direction from the plurality of individual
electrodes.

2. The ink-jet head according to claim 1, wherein the
25 sintered members and the individual electrodes have

substantially the same residual stress characteristics relative to the piezoelectric element.

3. The ink-jet head according to claim 1, wherein the
5 sintered members and the individual electrodes are made of the same material.

4. The ink-jet head according to claim 3, wherein the
sintered members and the individual electrodes have
10 substantially the same shape and the same size.

5. The ink-jet head according to claim 1,
wherein each of the individual electrodes, other than
the outermost one with respect to the arrangement direction
15 of the plurality of individual electrodes, is surrounded with corresponding ones of the individual electrodes arranged in a predetermined pattern; and

wherein the outermost one of the individual
electrodes with respect to the arrangement direction of the
20 plurality of individual electrodes is surrounded with a corresponding one of the individual electrodes and a corresponding one of the sintered members arranged in substantially the same pattern as the predetermined pattern.

25 6. The ink-jet head according to claim 1, wherein:

the plurality of pressure chambers are arranged adjacent to each other in a matrix on the plane of the passage unit;

the plurality of individual electrodes are arranged adjacent to each other in a matrix on the surface of the piezoelectric element at positions corresponding to the respective pressure chambers; and

a plurality of sintered members are arranged adjacent to each other so as to surround the plurality of individual electrodes arranged adjacent to each other in a matrix.

7. The ink-jet head according to claim 1, wherein the actuator unit further includes a common electrode that is formed, on a surface of the piezoelectric element opposite to the surface provided with the individual electrodes, to span the plurality of pressure chambers.

8. An ink-jet head comprising:

a passage unit in which a plurality of pressure chambers each connected to a corresponding nozzle are arranged adjacent to each other in a matrix along a plane; and

an actuator unit that is fixed to the passage unit to change the volume of the pressure chambers,

wherein the actuator unit includes:

a plurality of piezoelectric elements that are put in layers and cover the plurality of pressure chambers arranged adjacent to each other in a matrix,

5 a plurality of individual electrodes that have been sintered on a surface of one of the plurality of piezoelectric elements and are arranged adjacent to each other in a matrix at positions corresponding to the respective pressure chambers,

10 a plurality of sintered members that are, on the surface of the one of the plurality of piezoelectric elements, arranged adjacent to each other so as to surround the plurality of individual electrodes arranged adjacent to each other in a matrix, the sintered members and the individual electrodes having substantially the same
15 residual stress characteristics relative to the piezoelectric elements, and

a common electrode that is formed, on a surface of the one of the piezoelectric elements opposite to the surface provided with the individual electrodes, to span
20 the plurality of pressure chambers.

9. A method for manufacturing an ink-jet head comprising the steps of:

forming a passage unit in which a plurality of
25 pressure chambers each connected to a corresponding nozzle

are arranged adjacent to each other along a plane; and

forming an actuator unit that changes the volume of the pressure chambers,

the actuator-unit forming step including:

5 arranging conductive pastes at respective positions on a surface of a piezoelectric element, the positions including a plurality of positions for forming individual electrodes that are arranged corresponding to the respective pressure chambers, and one or more positions
10 spaced from an outermost one of the positions for forming the individual electrode with respect to an arrangement direction of the plurality of positions for forming the individual electrodes, in an outward direction from the plurality of positions, and

15 sintering the conductive pastes,

the method further comprising the step of fixing the actuator unit to the passage unit such that the piezoelectric element spans the plurality of pressure chambers and such that the individual electrodes are
20 positioned in correspondence with the respective pressure chambers, the individual electrodes being formed through the sintering process.

10. The method for manufacturing an ink-jet head
25 according to claim 9, wherein the conductive pastes made of

the same material are arranged at the respective positions.

11. The method for manufacturing an ink-jet head according to claim 10, wherein the conductive pastes all
5 having substantially the same shape and the same size are arranged at the respective positions.

12. The method for manufacturing an ink-jet head according to claim 9, wherein any one of the positions for
10 forming the individual electrodes is surrounded with corresponding ones of the conductive pastes that are arranged in substantially the same pattern.

13. The method for manufacturing an ink-jet head
15 according to claim 9, wherein:

in the passage-unit forming step, the plurality of pressure chambers are arranged adjacent to each other in a matrix on the plane of the passage unit; and

in the process of arranging the conductive pastes, in
20 the actuator-unit forming step, the conductive pastes are arranged at the plurality of positions for forming individual electrodes that are arranged adjacent to each other in a matrix at positions corresponding to the respective pressure chambers, and also the conductive
25 pastes are arranged at a plurality of positions adjacent to

each other so as to surround the plurality of positions for forming the individual electrodes.

14. A method for manufacturing ink-jet head comprising
5 the steps of:

forming a passage unit in which a plurality of pressure chambers each connected to a corresponding nozzle are arranged adjacent to each other along a plane; and

forming an actuator unit that changes the volume of
10 the pressure chambers,

the actuator-unit forming step including:

arranging conductive pastes in a region that is, on a surface of a piezoelectric element material having an actuator-unit-region formed thereon, larger than the
15 actuator-unit-region to enclose the actuator-unit-region, the actuator-unit-region including a region corresponding to the plurality of pressure chambers and having a border line same as an outline of the actuator unit, the conductive pastes being arranged in substantially the same
20 repetitive pattern as an arrangement pattern of the pressure chambers on the plane of the passage unit,

sintering the conductive pastes, and

cutting the piezoelectric element material along the border line of the actuator-unit-region,

25 the method further comprising the step of fixing the

actuator unit to the passage unit such that a piezoelectric element spans the plurality of pressure chambers and such that a plurality of individual electrodes are positioned in correspondence with the respective pressure chambers, the
5 piezoelectric element being obtained through the cutting process, the individual electrodes being ones located inside of a plurality of electrodes that are obtained through the sintering process.